In the Claims

The following list of pending claims replace any prior list of claims.

1. (Previously Presented) A solid-state device having a thin-film piezoelectric material forming a plurality of piezoelectric elements on an integrated silicon chip, a first set of the plurality of piezoelectric elements generating a force, and a second set of the plurality of piezoelectric elements generating an electrical signal in proportion to both the force and a rate of rotation of the solid-state device while rejecting spurious noise.

2. (Previously Presented) A solid-state rotational rate sensor device, comprising:

an integrated silicon chip;

a first set of piezoelectric elements on the silicon chip;

a second set of piezoelectric elements on the silicon chip;

wherein the first set of piezoelectric elements including a piezoelectric material and being actuated by an electrical signal, wherein when the electrical signal is applied on the piezoelectric material, the second set of piezoelectric elements senses the solid-state rotational rate sensor device.

3. (Previously Presented) The solid-state rotational rate sensor device of claim 2, wherein the first and second sets of piezoelectric elements are configured on a thin-film piezoelectric material.

4. (Previously Presented) The solid-state rotational rate sensor device of claim 2, further comprising a third set of piezoelectric elements on the silicon chip that sense a force generated by the first set of the piezoelectric elements.

5. (Previously Presented) The solid-state rotational rate sensor device of claim 4, wherein a signal sensed by at least one set of the second and third sets of piezoelectric elements is fed back to the first set of piezoelectric elements through an electronic feedback circuit.

6. (Previously Presented) The solid-state rotational rate sensor device of claim 2, wherein the electrical signal applied on the first set of piezoelectric elements is variable to modify a mechanical resonant frequency of the solid-state rotational rate sensor device.

7. (Previously Presented) The solid-state rotational rate sensor device of claim 2, wherein the piezoelectric material of the first set of the piezoelectric elements includes conductive electrodes placed on approximately opposite sides such that application of the electrical signal to the conductive electrodes causes a longitudinal variation of the piezoelectric material.

8. (Previously Presented) The solid-state rotational rate sensor device of claim 2, wherein the piezoelectric material is a thin-film piezoelectric material with a thickness of less than 10 microns and includes conductive electrodes placed on approximately opposite sides such that application of the electrical signal to the conductive electrodes causes a longitudinal variation of the thin-film piezoelectric material.

9. (Previously Presented) The solid-state rotational rate sensor device of claim 2, wherein the piezoelectric material is a thin-film piezoelectric material comprising a family of Lead-Zirconate-Titanate (PZT) compounds.

10. (Previously Presented) The solid-state rotational rate sensor device of claim 2, wherein the solid-state device includes a semi-rigid member fixed along a first edge to a proof mass and fixed along a second edge to the silicon chip.

11. (Previously Presented) The solid-state rotational rate sensor device of claim 10, wherein the semi-rigid support comprises a tuning fork.

12. (Previously Presented) The solid-state rotational rate sensor device of claim 10, wherein the semi-rigid support comprises a vibrating cup.

13. (Previously Presented) The solid-state rotational rate sensor device of claim 10, wherein the semi-rigid support comprises a comb structure.

14. (Previously Presented) The solid-state rotational rate sensor device of claim 10, wherein the semi-rigid support comprises an annular ring fixed along its outer circumference to the silicon chip and fixed along its inner circumference to a cylindrical proof mass.

15. (Withdrawn) A method of sensing a rotational rate of a solid-state device formed by a plurality of thin-film piezoelectric elements on an integrated silicon chip having a first set of piezoelectric elements, a second set of piezoelectric elements, and a third set of piezoelectric elements, comprising the steps of:

actuating the first set of piezoelectric elements by a first electrical signal; and

sensing rotational rate by the second and third sets of piezoelectric elements while rejecting spurious noise.

16. (Withdrawn) The method of claim 15, further comprising the steps of generating a second electrical signal by the second set of piezoelectric elements proportional to a mechanical force along a first direction, and generating a third electrical signal by the third piezoelectric elements proportional to the mechanical force along a second direction, wherein the second direction is orthogonal to the first direction, and wherein phase of the third electrical signal shifts relative to the second electrical signal in response to rotation movement of the solid-state device around a third direction, and the third direction is orthogonal to both the first direction and the second direction.

17. (Withdrawn) The method of claim 15, further comprising the steps of connecting the second and third electrical signals to a phase-shift detection circuit, and generating an electrical output signal in proportion to a shift of the phase.

18. (Previously Presented) A rotational rate sensor, comprising:

an integrated silicon chip;

a proof mass;

a first piezoelectric element for generating a force on the proof mass along a first direction by a first electrical signal;

a second piezoelectric element for generating a second electrical signal in proportion to the force on the proof mass along the first direction;

a third piezoelectric element for generating a third electrical signal in proportion to the force on the proof mass along a second direction; and

an electrical circuit connected to the first piezoelectric element for applying the first electrical signal.

19. (Previously Presented) The rotational rate sensor of claim 18, further comprising a phase shift detection circuit that generates an electric output signal in proportion to a phase shift between the second and third electrical signals.

20. (Previously Presented) The rotational rate sensor of claim 18, further comprising a feedback circuit for feeding back a signal sensed by at least one set of the second and third sets of the piezoelectric elements to the first piezoelectric element.